(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 538 593 A1**

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **92114784.9**

(51) Int. Cl.5: **B65H 1/04**

(22) Date of filing: **11.04.88**

This application was filed on 28 - 08 - 1992 as a divisional application to the application mentioned under INID code 60.

(30) Priority: **16.04.87 JP 92029/87**
16.04.87 JP 56711/87 U
17.04.87 JP 57534/87 U
14.05.87 JP 70911/87 U
28.05.87 JP 79873/87 U

(43) Date of publication of application:
28.04.93 Bulletin 93/17

(60) Publication number of the earlier application in accordance with Art.76 EPC: **0 287 915**

(84) Designated Contracting States:
DE FR GB

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(54) **Paper feed device and paper cassette therefor.**

(57) A paper cassette is formed to store multiple types of different sized media and performs paper-feeding. A media load plate is loaded with said multiple types of different sized media. A media back edge guide assembly is mounted to a media load plate on which is loaded multiple types of different-sized media, to position the midea loaded on the media load plate.

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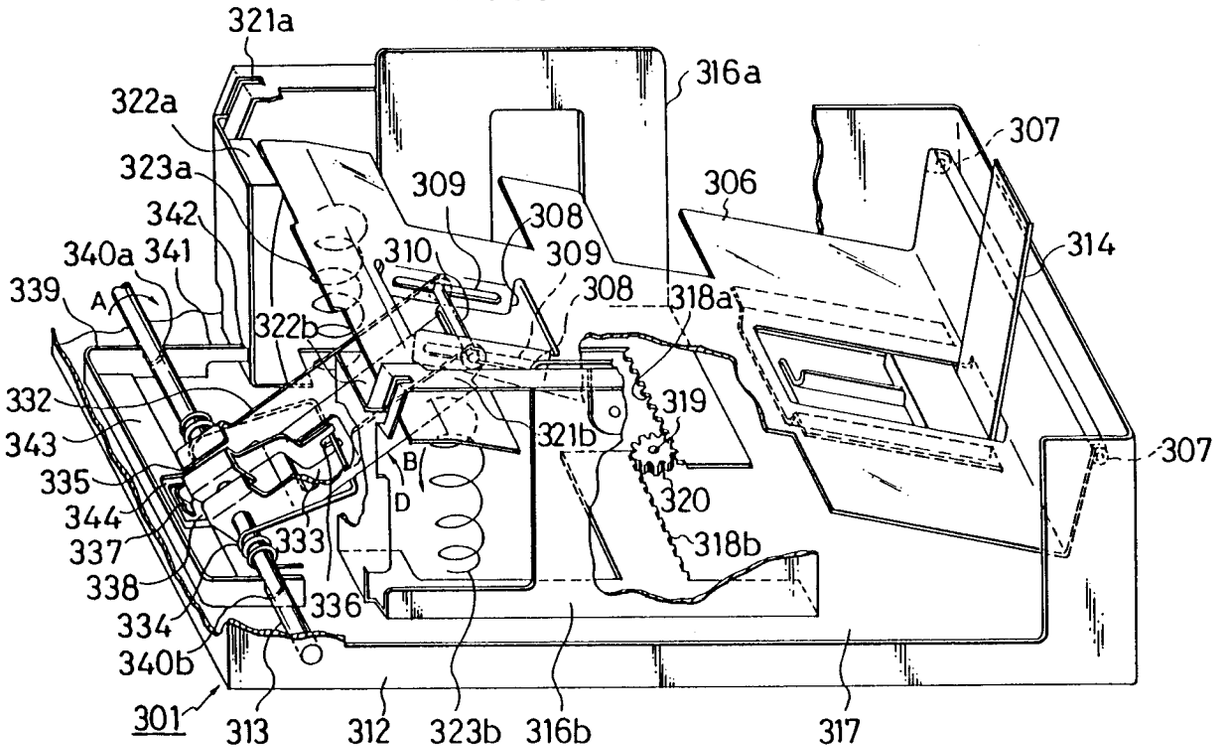
FIG. 2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BACKGROUND OF THE INVENTION

This invention relates to a paper cassette which contains cutforms and other media which are supplied to terminal devices such as printers.

A device to automatically supply media to terminal devices such as printers was disclosed in Japanese Patent Application Laid-open No. 218238/1985. When different sized media are supplied with this type of device, there are conventionally different hoppers or paper cassettes for each size of media. Media are stored in and supplied from these hoppers.

The following is an explanation of the conventional automatic paper feed device based on the drawings. Figure 1 is a partially cut-away side view showing the conventional paper feed device.

Media 2 is stacked and stored in hopper or cassette 3, which is installed in automatic paper feed device 1. Printer 4 is placed on top of automatic paper feed device 1. Supply roller 5 is installed above cassette 3 and feed roller 6 is also disposed inside the device. Moreover, spring 7 is provided underneath media 2. Cassette container 9 is installed to the side of automatic paper feed device 1 and printer 4. Cassette container 9 contains cassettes 8 which store specific sizes of media which are not in use.

The operation of the conventional automatic paper feed device will be explained next. The media 2 which is stacked and stored in cassette 3 is pushed by spring 7 into contact with supply roller 5. Supply roller 5 is rotated in the direction of arrow G by a drive means not shown, and this causes the media to begin to be fed from the top, one sheet at a time. Media 2, which has begun to be fed, is sent to printer 4 by feed roller 6.

When one wishes to print media which is different in size from media 2 (stacked and stored in cassette 3) with printer 4, one takes cassette 3 out of automatic paper feed device 1. Cassette 8, in which is stored the media of the size desired, is then taken out of cassette container 9 and installed in automatic paper feed device 1. Paper feed to printer 4 may then be performed. Cassette 3, which has been taken out of automatic paper feed device 1 is then stored in cassette container 9. By manual input instructions are sent to printer 4 concerning the size of the media newly installed in automatic paper feed device 1.

However, different cassettes for respective sizes of media are necessary in devices constructed as above. Also, since the automatic paper feed device permits mounting of only one cassette a separate place or container for the multiple cassettes storing media not in use are needed. Because of this, cassettes not being used must be placed in the immediate vicinity of the automatic paper feed device and the amount of space needed for the installation of the device is a problem. The automatic paper feed device described above also has the fault of requiring a number of cassettes in which specific sizes of media are stored. Because of this cassette container must be provided and this increases the number of structural parts, and raises the price of the automatic paper feed device.

Furthermore, because the operator must send instructions to the printer concerning the size of the media it is easy for errors to occur. When errors occur it is necessary to reprint, and this is a problem because media is wasted. Another problem associated with the prior art is that the media is pushed against the hopping roller and paper feed is accomplished by the same coil springs always pushing up the media load plate. But because the weight of the media stored in the paper cassette varies according to its size, the pressure by which the top of the media is pushed against the hopping roller varies.

Therefore too great a pressure will be obtained when feeding smaller media if springs whose pressure is appropriate to larger media are used. This will increase the occurrence of multiple feeding, in which 2 or 3 sheets are fed at the same time. When springs appropriate to smaller media are used, the pressure obtained will be too little for larger media and feed misses, in which the media is not fed, will occur more often.

A single paper cassette suitable for different sizes of paper is disclosed in the document DE-A-33 31 077. It comprises a media load plate positioning the paper by a back edge guide assembly, which is in particular capable for obtaining the paper size and providing electrical signals according to the paper size.

DE-A-24 16 782 is concerned with a paper cassette comprising in particular a turnable paper load plate and some guide members.

SUMMARY OF THE INVENTION

An object of this invention is to solve the problems described above, making it possible for the installation area to be smaller and providing an inexpensive automatic paper feed device of excellent operability.

Another object of this invention is to provide a paper cassette from which can be obtained a pressure appropriate to the size of the media in question, and which is able thereby to feed media with stability.

According to the invention, there is provided a paper cassette which stores a number of types of media on a media load plate, one end of which is journalled (rotatably supported) in such a way that

it is able to rotate and the other end of which is rotated up and down by a reset arm, and performs paper feed with the media pushed against a hopping roller by a spring which pushes the media load plate upwards, comprising an auxiliary resilient member which pushes the reset arm up, and a sub-arm, one end of which abuts and stops said auxiliary resilient member and which rotates together with the auxiliary resilient member, and a means provided in the rotation range of said sub-arm for regulating the rotation of said sub-arm according to the size of the media by being able to move in accordance with the size of media.

When the paper cassette stores a large media the media load plate is raised by a reset arm and this causes a sub-arm to rotate following the reset arm. This in turn causes an auxiliary resilient member to push up the reset arm and media load plate. The pressure by which the media is pushed against the hopping roller is therefore the combined upward pushing force of the coil springs and the auxiliary resilient member.

When a smaller media is stored, the sub-arm is prevented from rotating even though the media load plate is pushed up by the reset arm. Therefore, because the auxiliary resilient member is separated from the reset arm, the upward pushing force of the auxiliary resilient member is not transmitted to the media load plate. The pressure pushing the media against the hopping roller is therefore only the upward pushing force of the coil springs.

According to a further aspect of the invention, there is provided a paper cassette which stores a number of types of media on a media load plate, one end of which is journalled in such a way that it is able to rotate and the other end of which is rotated up and down by a reset arm, and which positions the width of the media by moving a side plate, and which performs paper feed with the media pushed against a hopping roller by a spring which pushes said other end of the media load plate upwards, comprising an auxiliary resilient member which rotates following said reset arm and pushes the reset arm up, and a means, formed integrally with the side plate, which regulates the rotation of said auxiliary arm by moving in accordance with the size of the media.

When the paper cassette stores a large media the media load plate is raised by a reset arm and this causes an auxiliary resilient member to rotate following the reset arm. This in turn causes the auxiliary resilient member to push up the reset arm and media load plate. The pressure by which the media is pushed against the hopping roller is therefore the combined upward pushing force of the coil springs and the auxiliary resilient member.

When a smaller media is stored, the auxiliary resilient member does not rotate even though the media load plate is pushed up by the reset arm. Therefore, the upward pushing force of the auxiliary resilient member is not transmitted to the reset arm media load plate. The pressure pushing the media against the hopping roller is therefore only the upward pushing force of the coil springs.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a partial cut-away side view showing the conventional automatic paper feed device.

Figure 2 is a cut-away perspective view showing embodiment of paper cassette according to this invention.

Figure 3 is a cut-away perspective view showing the lowered state of the media load plate.

Figure 4 is a cut-away view showing the raised state of the media load plate.

Figure 5 is a cut-away perspective view showing another embodiment of this invention.

Figure 6 is a front view showing the state of paper cassette according to the embodiment of Figure 5 when it is installed in a paper feed device.

Figure 7 is a cut-away perspective view showing the state of the media load plate lowered in the embodiment of Figure 6

Figure 8 is a cut-away view showing the state of the media load plate raised in the embodiment of Figure 6

Figure 9 is a cut-away perspective view of a further embodiment of this invention.

An embodiment of this invention will be explained referring to Figure 2 through Figure 4. Figure 2 is a cut-away perspective drawing of a paper cassette according to this embodiment. Figure 3 is a front view showing the state of a paper cassette according to this embodiment when it is installed in a paper feed device.

The structure will be explained first.

Paper cassette 301 is attached so that L-shaped media load plate 306 is able to rotate with fulcrum 307 as center. A pair of flanges 308 are formed in the front bottom of media load plate 306. On flanges 308 are oval holes 309. Shaft 310 is inserted into oval holes 309 so that it is able to slide. Both ends of shaft 310 are attached to reset arm 332. Thus reset arm 332 is attached through shaft 310 to the front bottom of media load plate 306. Media back edge guide plate 314 is also attached to the back of media load plate 306. Media back edge guide plate 314 positions the media loaded on media load plate 306 in the feed direction. In order to respond to the size of the media, media back edge guide plate 314 is able to move along guide rail 315, which is formed in the

feed direction.

Side plates 316a and 316b, which position the media in the width direction, are mounted on each side of media load plate 306. Racks 318a and 318b are formed on side plates 316a and 316b along the bottom plate of frame 312. Racks 318a and 318b mate with pinion 320 which rotates on post 319 attached to bottom plate 317. Separation claws 321a and 321b are also attached to side plates 316a and 316b. Guide blocks 322a and 322b are formed in the front areas of the side plates 316a and 316b.

A pair of coil springs 323a and 323b are mounted in the front bottom area of media load plate 306 in the space between it and bottom plate 317. The force with which said coil springs 323a and 323b push up media load plate 306 is set to a pressure appropriate for pushing smaller media against hopping roller, not shown, when they are stored on media load plate 306.

Reset arm 332 is attached at two points to shaft 313 journalled by frame 312 of cassette 301. Reset arm 332 is provided with an opening 333. Attached to shaft 313 on both sides of reset arm 332 is torsion spring 334, which is the auxiliary resilient member. The torsion spring 334 is bent around the back of reset arm 332 and constantly energizes reset arm 332 upwards.

Furthermore, sub-arm 335 is attached to shaft 313 in between the attachment points of reset arm 332. A U-shaped cutout 336 is formed on one end of sub-arm 335. This cutout holds torsion spring 334 in the bottom of opening 333. L-shaped protrusion 337 is formed on the other end of sub-arm 335. Clearance opening 338 is formed in the position on bottom plate 317 where the protrusion 337 moves to when sub-arm 335 rotates in the direction shown by arrow D in Figure 30. This makes it possible for sub-arm 335 to rotate further.

Bracket 339 is provided on the bottom of the shaft 313. Shaft 313 is installed between U-shaped holes 340a and 340b of bracket 339. The tip of arm section 341 of bracket 339 goes into hole 342 provided on side plate 316a. Therefore, when side plate 316a moves according to the size of the media, it is accompanied by bracket 339 which thereby moves parallel to shaft 313. Plate 343 is also provided on bracket 339. Opening 344 is provided on plate 343 in a position which overlaps the position of clearance hole 338 on bottom plate 317 when bracket 339 is moved to store a wide media.

The operation of the embodiment will be explained next.

Explanation of the storage of a large or wide media in the paper cassette will first be made. Until paper cassette 301 is pulled out of device 11, media load plate 306 is in a lowered state and is held in this state by a locking means not shown in the drawings. Media back edge guide plate 314 is then moved along guide rail 315 so that it fits the size (length) of the media. Side plates 316a and 316b are also moved to fit the size (width) of the media. When side plate 316a is moved to fit the size of the media, side plate 316b is moved by pinion 320 the same distance in the opposite direction. Also the movement of side plate 316a causes a parallel movement in bracket 339 and shaft 313. At this time opening 344 on bracket 339 moves to a position which overlaps clearance hole 338 of bottom plate 306.

A wide media is now set and paper cassette 301 is returned to device 11. Next, the unshown locking means described above is released. this causes media load plate 306 to be rotated and raised by a pair of coil springs 323a and 323b. The direction of rotation is opposite to that shown by arrow B and fulcrum 307 is the center. This pushes the top of the media against the hopping roller. Reset arm 332 also rotates in the direction shown by arrow D to accompany this movement with shaft 313 as center. Opening 344 of bracket 339 and clearance hole 338 of bottom plate 317 are positioned in the rotation range of protrusion 337 at this time, making even more rotation possible. Therefore, torsion spring 334, which is inside groove 336 of sub-lever 335, rotates with shaft 313 as center so that it follows the rotation of reset arm 332. The top of the media is pushed against hopping roller, and though the rotation of reset arm 332 is stopped, torsion spring 334 pushes farther up from the back of reset arm 332. This upward pushing force becomes a force pushing up media load plate 306.

Therefore the pressure which pushes the top of a large media stored on media load plate 306 against the hopping roller is the combined upward pushing force of coil spring pair 323a and 323b, and torsion spring 334. Hopping roller is then rotated so that paper feed is performed with the appropriate pressure.

Explanation of the operation when a small or narrow media is stored will be made next referring to Figure 3 and Figure 4. Figure 3 is a cut-away perspective view showing the lowered state of the media load plate 306. Figure 4 is a cut-away perspective view showing the raised state of the media load plate 306. The operations up to the point where media load plate 306 is lowered and side plates 316a and 316b and media back edge guide plate 314 are moved to fit the size of the media are the same as those described above and will therefore be omitted.

Bracket 339 moves parallel to shaft 313 to accompany the movement of side plate 316a. Because protrusion 337 of subarm 335 is separated from plate 343 of bracket 339 at this time, bracket 339 is able to move smoothly. As shown in Figure

3, bracket 339 moves until plate 343 is in a position over clearance hole 338 of bottom plate 317. A smaller media is then stored on media load plate 306.

The unshown locking means is then released and, as shown in Figure 4, this causes media load plate 306 to be pushed up by coil spring pair 323a and 323b. Accompanying this, reset arm 332 is pulled up by media load plate 306, rotating upwards with shaft 313 as center. Torsion spring 334 and sub-arm 335 attempt to rotate with shaft 313 as center in the direction shown by arrow E in Figure 4, but are prevented from doing so because protrusion 337 of sublever 335 strikes plate 343 of bracket 339. Therefore, as shown in Figure 4, reset arm 332 and torsion spring 334 are isolated. This means that the force pushing up media load plate 306 is only the upward pushing force of coil spring pair 323a and 323b. Because the upward pushing force of coil spring pair 323a and 323b is set so as to be appropriate for smaller media, the pressure pushing the top of the media against the hopping roller is a pressure appropriate for the feeding of smaller media. The paper feed operation is the same as for the feeding of larger media.

In this embodiment, a torsion spring was used as the auxiliary resilient member energizing the reset arm. It is, of course, possible to use something other than this, a plate spring, for example.

Another embodiment of this invention will be explained referring to Figure 5 through Figure 9. Figure 5 is a cut-away perspective drawing of a paper cassette according to this embodiment. Figure 6 is a front view showing the state of this embodiment of a paper cassette when it is installed in a paper feed device.

This embodiment is similar to the embodiment of Figure 2 through Figure 4. The points of difference are as follows: Tip 433 of torsion spring 432 is bent downwards in an L-shape around the back of reset arm 411 and constantly energizes reset arm 411 upwards. Convex member 434 is formed integrally in side plate 416a facing bottom plate 417. Opening 435 is provided in the front part of bottom plate 417. Sub-arm 315 and clearance opening 338 of the embodiment of Figure 2 through Figure 4 are omitted.

The operation of the embodiment will be explained next.

In order to store media 424 in paper cassette 431, shaft 413 is first rotated in the direction shown by arrow A by a lever not shown in the drawings. This causes reset arm 411 to rotate in the direction shown by arrow D with shaft 413 as its center. Media load plate 406 then rotates in the direction shwon by arrow B with fulcrum 407 as its center and is lowered. The rotation of reset arm 411 causes torsion spring 432 to rotate in the same direction. When reset arm 411 has rotated to a specified position it is held in that state by a holding means not shown in the drawings. At this time tip 433 of torsion spring 432 enters opening 435 provided on bottom plate 417. Torsion spring 432 is located below bottom plate 417. Cassette 431 is pulled out from the device in this state.

Explanation of the storage of a large or wide media in the cassette will be made first. Media back edge guide plate 414 is moved along guide rail 415 to the length of the media. Side plate 416a is also moved to fit the length of the media in the width direction. When side plate 416a is moved to fit the size of the media, side plate 416b is moved by pinion 420 the same distance in the opposite direction.

A large media is now set and paper cassette 431 is pushed back into device 11. Next, shaft 413 is rotated in the direction shown by arrow E in Figure 5 by a lever not shown in the drawing, and reset arm 411 is released. This causes media load plate 406 to be rotated and raised by a pair of coil springs 423a and 423b. The direction of rotation is shown by arrow F and fulcrum 407 is the center. This pushes the top of the media against hopping roller 403. Reset arm 411 also rotates with shaft 413 as center, being pulled up by media load plate 406. At this time torsion spring 432 rotates with shaft 413 as its center following the rotation of reset arm 411. The top of the media is pushed against a hopping roller 403 and though the rotation of reset arm 411 is stopped, torsion spring 432 pushes farther up from the back of reset arm 411. This upward pushing force becomes a force pushing up media load plate 406.

Therefore the pressure which pushes the top of a large media stored on media load plate 406 against hopping roller 403 is the combined upward pushing force of coil spring pair 423a and 423b, and torsion spring 432. Hopping roller 403 is then rotated in the direction shown by arrow C in Figure 6, the media is separated into sheets by separation claws 421a and 421b, and paper feed is thus accomplished.

Explanation of the operation when a small media is stored will be made next referring to Figure 7 and Figure 8. Figure 7 is a cut-away perspective drawing showing the state in which the media load plate is lowered. Figure 8 is a cut-away perspective drawing showing the state in which the media load plate is raised.

As described above, media load plate 406 of paper cassette 431, which has been pulled out of paper feed device 11 in order to set the media, is lowered as shown in Figure 7, and tip 433 of torsion spring 432 is in opening 435. Media back edge guide plate 414 and side plates 416a and 416b are moved respectively to the length in the

direction of paper feed and the width of the media. The movement of side plate 416a causes convex member 434 to move to a position above opening 435 of bottom plate 417. A small media is then loaded on media load plate 406 and set, and cassette 431 is returned to device 402.

Next, shaft 413 is rotated in the direction shown by arrow E in Figure 5 by a lever not shown in the drawings, and reset arm 411 is released. This causes media load plate 406 to be rotated and raised by a pair of coil springs 423a and 423b. The direction of rotation is shown by arrow F in Figure 36 and fulcrum 407 is the center. This pushes the top of the media against hopping roller 403. Reset arm 411 also rotates upwards with shaft 413 as center, being pulled up by media load plate 406. At this time torsion spring 432 also rotates following the rotation of reset arm 411. However, tip 433 strikes the convex member 434 and torsion spring 432 is prevented from rotating. Therefore, as shown in Figure 36, reset arm 411 and torsion spring 432 separate. This means that the force pushing up media load plate 406 is only the upward pushing force of coil springs 423a and 423b. Because the upward pushing force of coil spring pair 423a and 423b is set so as to be appropriate for smaller media, the pressure pushing the top of the media against hopping roller 403 is a pressure appropriate for the feeding of smaller media. The hopping roller 403 is rotated, and the media is separated into sheets by separation claws 421a and 421b. The paper feed is thereby performed.

A further embodiment of this invention will be explained referring to Figure 9.

In this embodiment, as in the embodiment of Figure 5 through Figure 8, the torsion spring 432 has a tip 433 which is bent downwards in an L-shape, and torsion spring 432 is attached to shaft 413. In place of convex member 434 of the embodiment of Figure 6 through Figure 9 convex member 441, bent upwards in an L-shape, has been formed integrally with side plate 416a.

When a large media is stored on it, convex member 441 is separated from tip 433 of torsion spring 432 by the movement of side plate 416a. This causes torsion spring 432 to be able to rotate freely. When a small media is stored on it, convex member 441 moves so that it covers the top of tip 433 of torsion spring 432, preventing torsion spring 432 from rotating. Therefore the same effects are obtainable as from the embodiment of Figure 33 through Figure 8. Furthermore, because there is no need to provide an opening on the bottom plate of the cassette in the above embodiment, it has the effect of simplifying the structure.

As explained in detail above, when loading and storing wide media and narrow media on a media load plate, the above-described embodiments make it possible to obtain a large upward pushing force for wider media as well as an appropriate force for narrower media. Therefore, the pressure with which the top of the media is pushed against the hopping roller will be a pressure appropriate to the size of the media. This will eliminate double feeding and feeding misses generated during feeding due to the differences in media size. Thus a paper cassette which is able to perform feeding in a stable manner may be provided with a simple parts structure and at an inexpensive cost.

Claims

1. A paper cassette which stores a number of types of media on media load plate (306), one end of which is journalled in such a way that it is able to rotate and the other end of which is rotated up and down by a reset arm (332), and which positions the width of the media by moving a side plate (316a, b), and which performs paper feed with the media pushed against a hopping roller by a spring which pushes said other end of the media load plate upwards, comprising

   an auxiliary resilient member (334) which rotates following said reset arm and pushes the reset arm ups (332), and

   a means (318a, b), formed integrally with the side plate, which regulates the rotation of said auxiliary arm by moving in accordance with the size of the media.

2. Paper cassette according to claim 1, characterized by a sub-arm (335), one end of which abuts and stops the auxiliary resilient member (334) and which rotates together with the auxiliary resilient member (334), while the means (318 a, b) is provided in the rotation range of the sub-arm (335) for regulating the rotation of the sub-arm (335) according to the size of the medium by being able to move in accordance with the size of the medium.

FIG.1

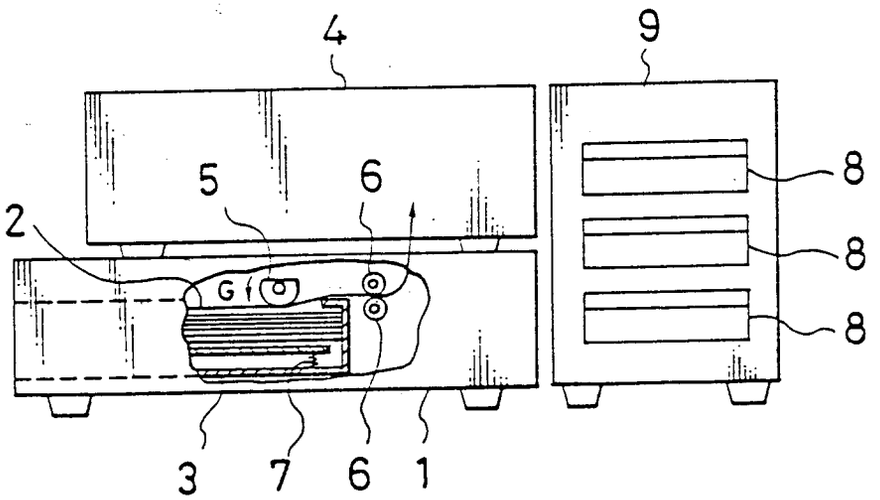

FIG. 2

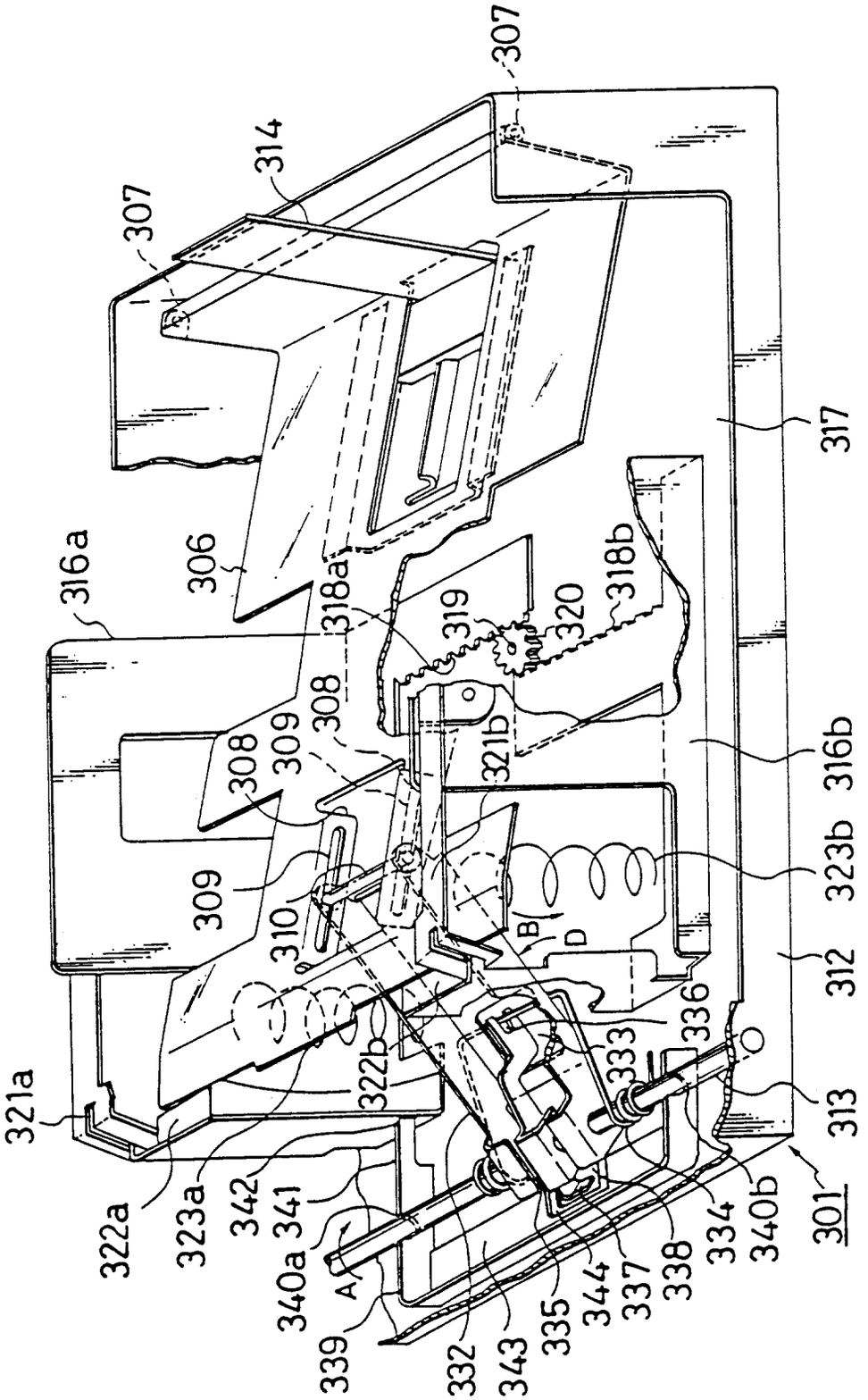
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FIG. 3

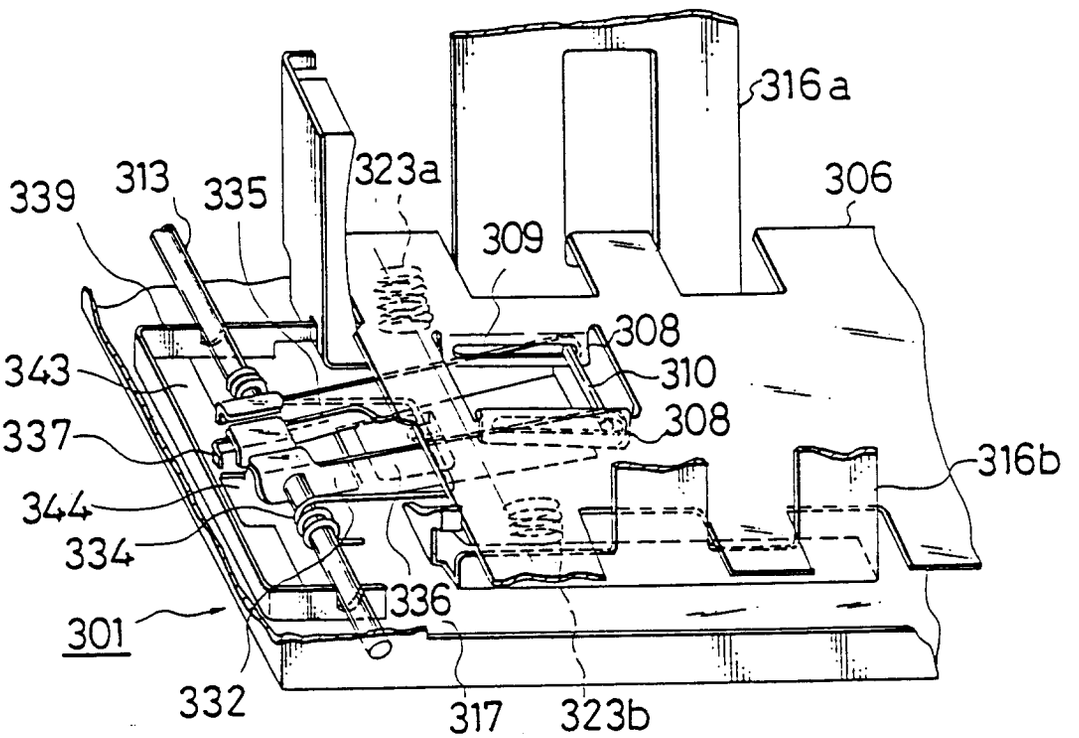
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FIG. 4

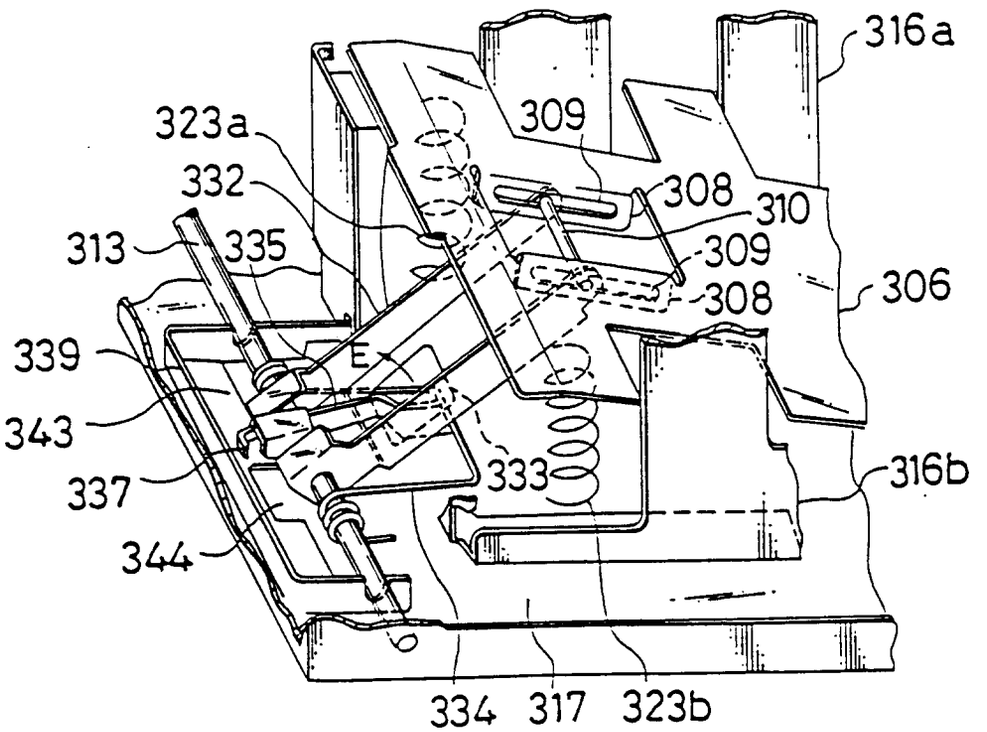
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FIG. 5

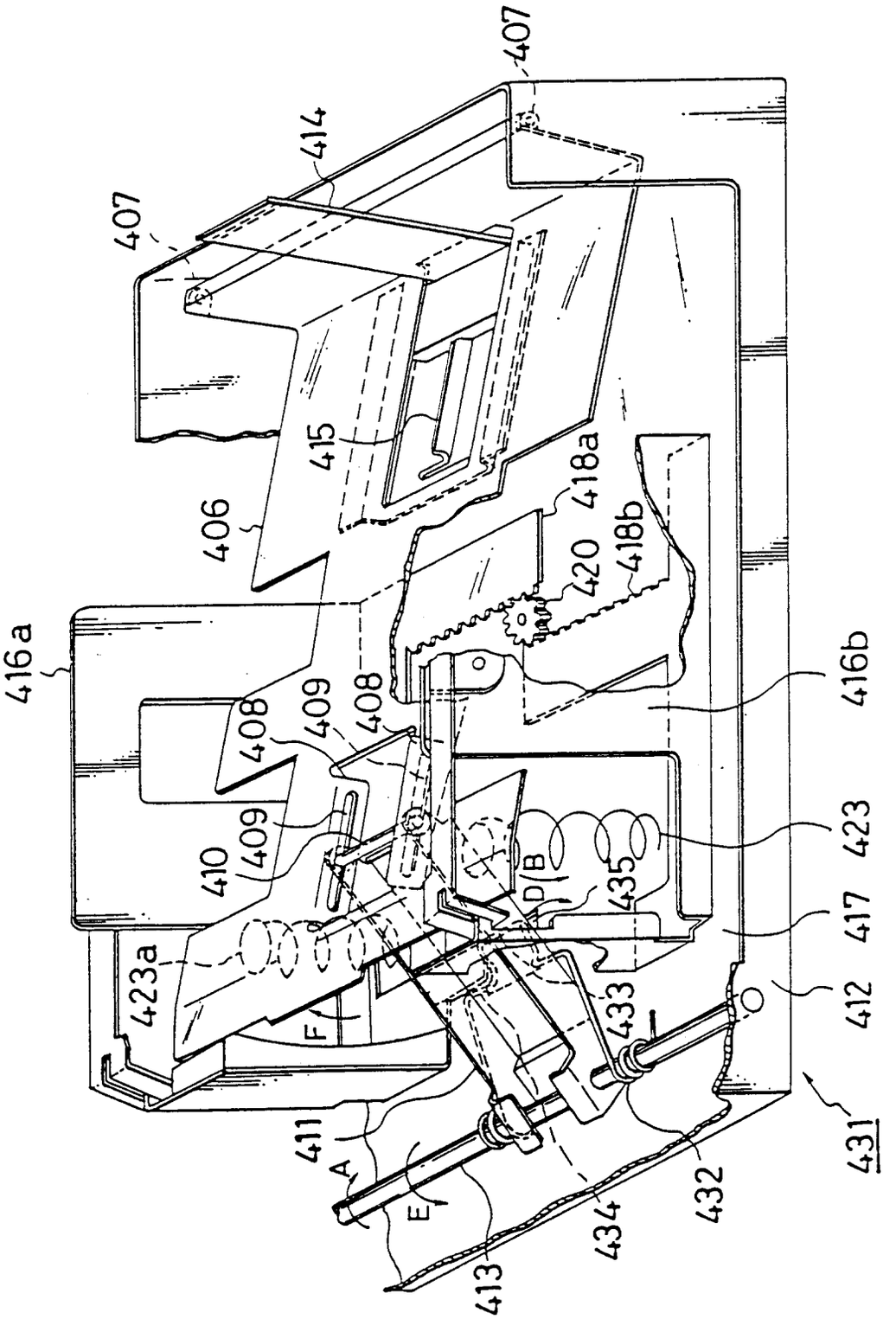
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FIG. 6

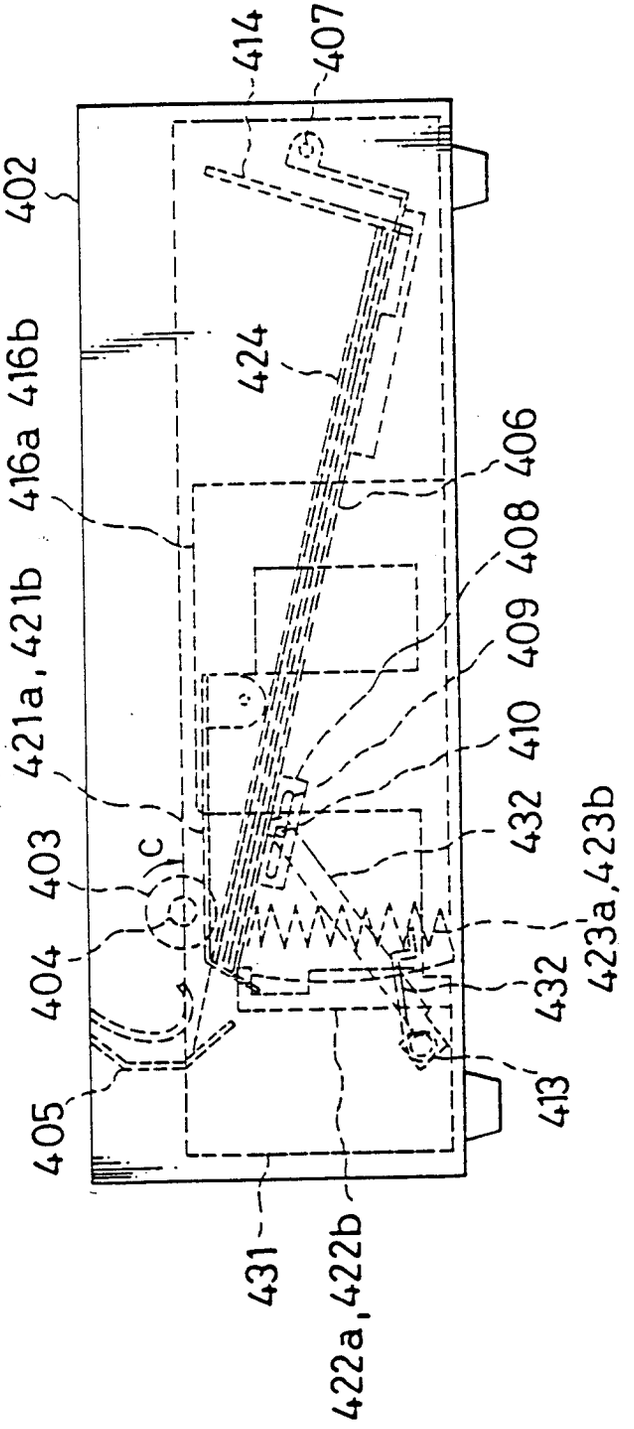
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FIG. 7

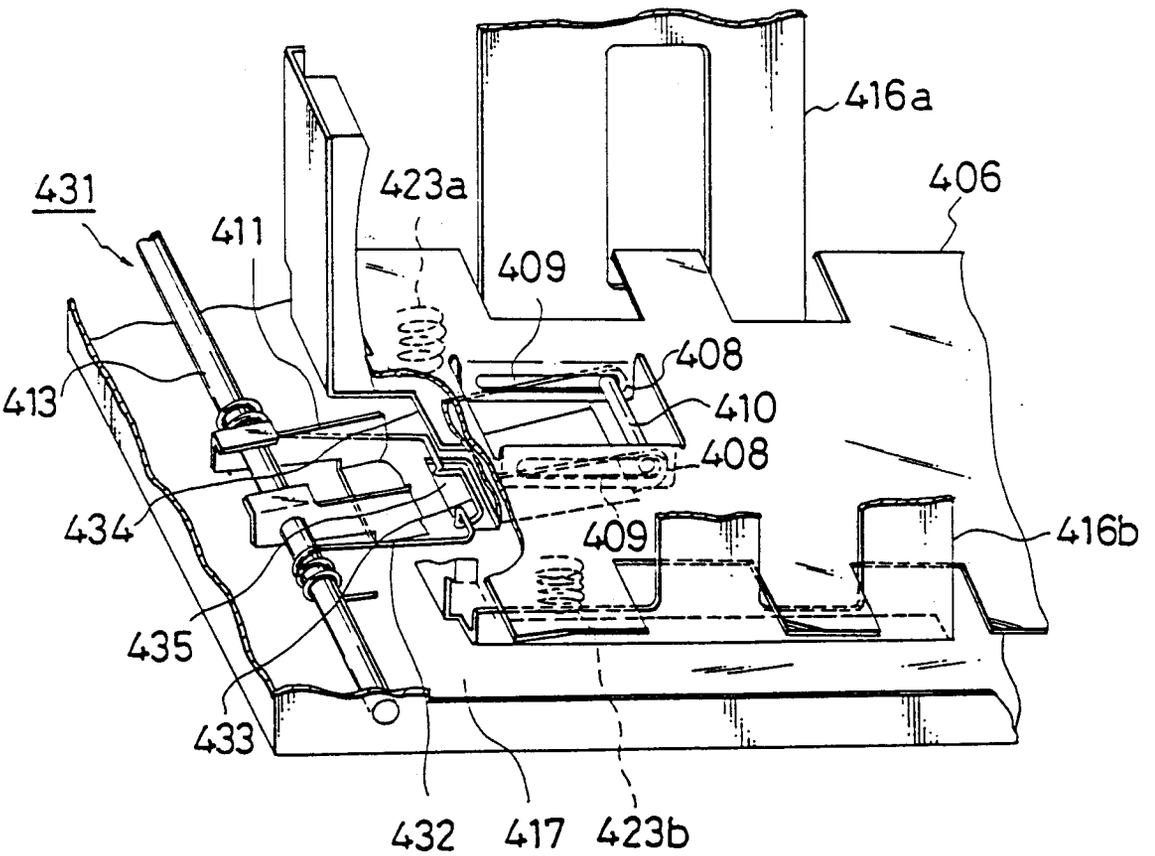
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FIG. 8

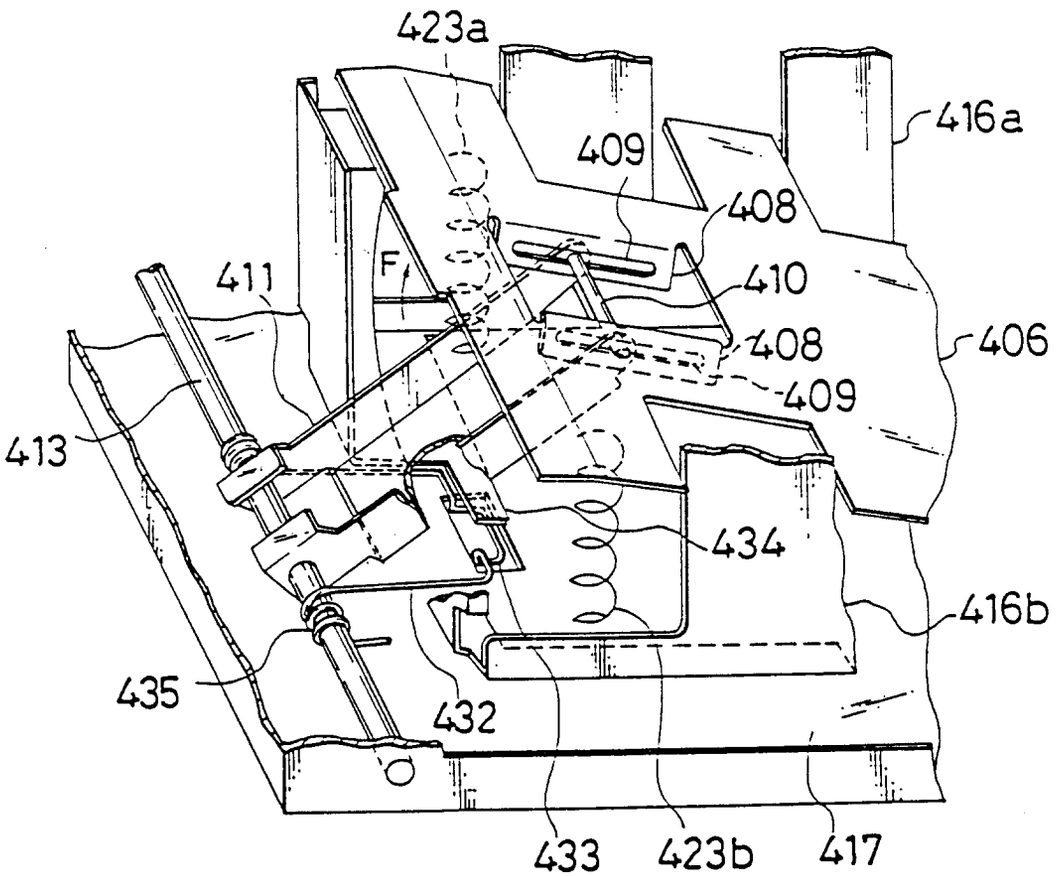
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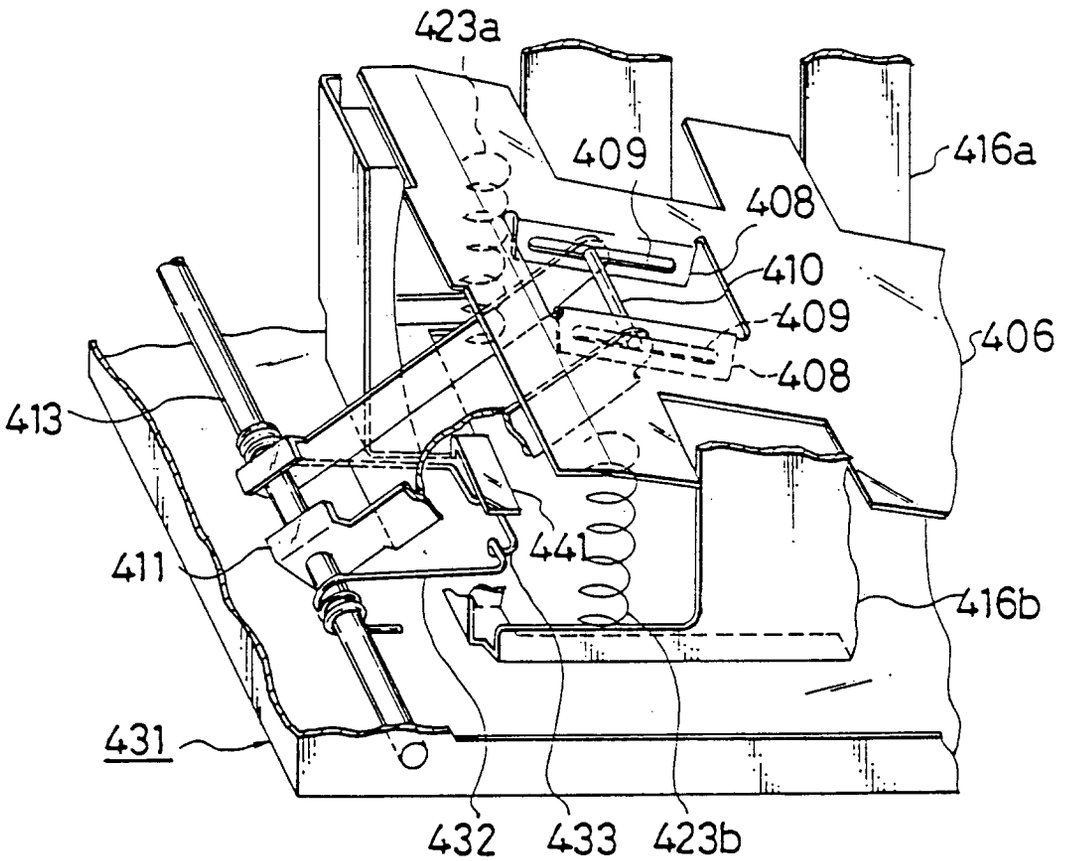
FIG. 9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European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 11 4784

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
Y	DE-A-3 331 077 (KONISHIROKU PHOTO INDUSTRY) * page 2, line 17 - page 4, line 1; claims 1,2; figures 1-5 *	1,2	B65H1/04
Y	US-A-4 307 878 (TATEOMI KONO) * abstract; claims 1-6; figures 1-5B * * column 1, line 60 - column 2, line 32 *	1,2	
A	US-A-3 934 870 (LAURENCE G. MILLER ET AL.) * abstract; claims 1-3; figures 3-5 * * column 3, line 16 - column 4, line 43 *	1,2	
A	DE-A-2 416 782 (CANON K. K.) * page 7, line 17 - page 9, line 2; claims 1-4; figures 1-4 *	1,2	
A	FR-A-2 386 465 (HOECHST AKTIENGESELLSCHAFT) * claim 1; figures 1-7 *	1,2	
A	US-A-3 153 534 (ROLF W. EICHLER ET AL.) * column 6, line 41 - line 74; claims 1,2; figures 4-7 *	1	TECHNICAL FIELDS SEARCHED (Int. Cl.4) B65H B41J G03G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	07 OCTOBER 1992	MEULEMANS J.P.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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